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Roh

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(45) **Date of Patent: Aug. 9, 2016**

(54) **WEARABLE ELECTRONIC DEVICE HAVING TOUCH RECOGNITION UNIT AND DETACHABLE DISPLAY, AND METHOD FOR CONTROLLING THE ELECTRONIC DEVICE**

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(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

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G06F 3/01	(2006.01)
G06F 3/0488	(2013.01)
H04M 1/05	(2006.01)
H04M 1/60	(2006.01)
H04M 1/725	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/011*** (2013.01); ***G06F 3/0488*** (2013.01); ***H04M 1/05*** (2013.01); ***H04M 1/605*** (2013.01); ***H04M 1/72519*** (2013.01); *H04M 1/72558* (2013.01); *H04M 2250/12* (2013.01); *H04M 2250/22* (2013.01)

(58) **Field of Classification Search**

CPC H04R 2420/07; H04R 5/033; H04R 2201/107; G06F 1/163; G06F 3/011; G06F 1/1626; G06F 1/1654; G06F 3/0346; G06F 3/0362; G06F 3/044; G06F 3/0488; H04M 1/05; H04M 1/6058; H04M 1/605; H04M 1/72519; H04M 1/72558; H04M 2250/12; H04M 2250/22

See application file for complete search history.

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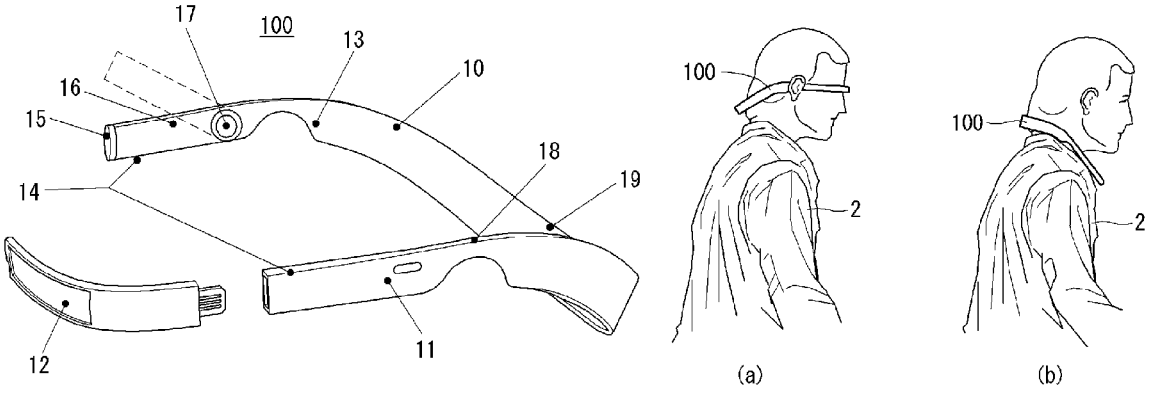
Primary Examiner — Lun-Yi Lao
Assistant Examiner — Elliott Deaderick
(74) *Attorney, Agent, or Firm* — Lee, Hong, Degerman, Kang & Waimey; Jonathan Kang; Harry Lee

(57) **ABSTRACT**

An electronic device includes: a touch recognition unit provided on at least one side of the frame; a sensing unit that detects where the frame is worn; and a controller that detects, through the sensing unit, at least one of a first position where the frame is worn on the user's head, a second position where the frame is worn around the user's neck, and a third position where the frame is separate from the user, detects a touch input on the touch recognition unit, and controls call-related operations based on at least either the detected position where the frame is worn or the detected touch input. Accordingly, a variety of call-related or multimedia data-related functions can be used efficiently by changing the position where a frame wearable around the neck or on the head is worn.

14 Claims, 22 Drawing Sheets



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* cited by examiner

FIG. 1

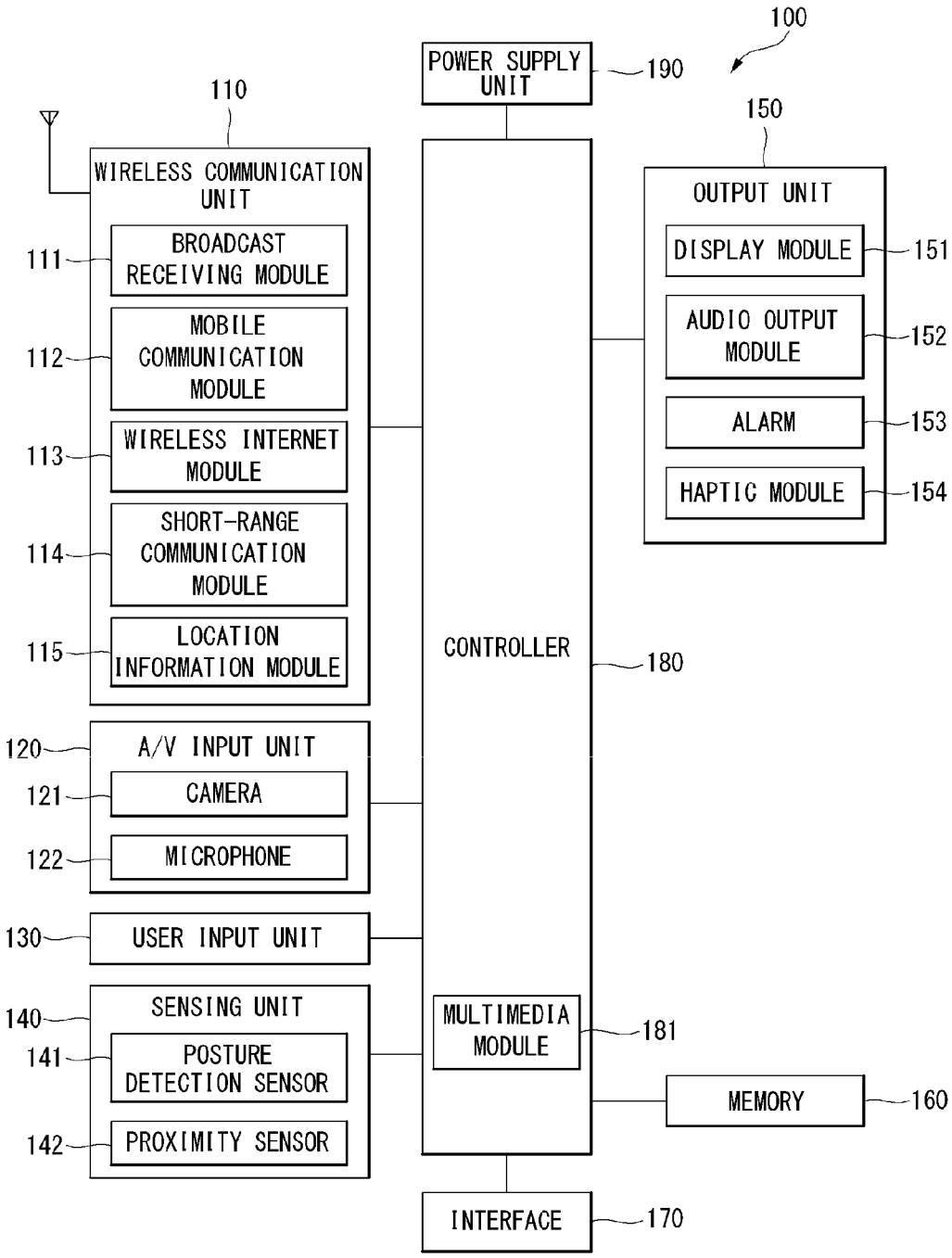

100
POWER SUPPLY UNIT
190
110
150
WIRELESS COMMUNICATION UNIT
OUTPUT UNIT
111
BROADCAST RECEIVING MODULE
DISPLAY MODULE
151
112
MOBILE COMMUNICATION MODULE
AUDIO OUTPUT MODULE
152
113
WIRELESS INTERNET MODULE
ALARM
153
114
SHORT-RANGE COMMUNICATION MODULE
HAPTIC MODULE
154
115
LOCATION INFORMATION MODULE
CONTROLLER
180
120
A/V INPUT UNIT
121
CAMERA
122
MICROPHONE
130
USER INPUT UNIT
140
SENSING UNIT
141
POSTURE DETECTION SENSOR
142
PROXIMITY SENSOR
MULTIMEDIA MODULE
181
MEMORY
160
INTERFACE
170

FIG. 2

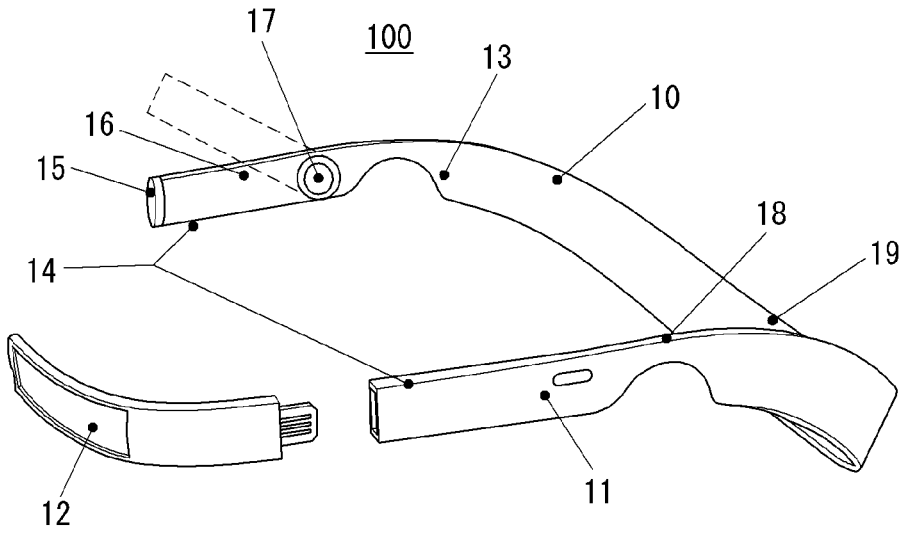


FIG. 3

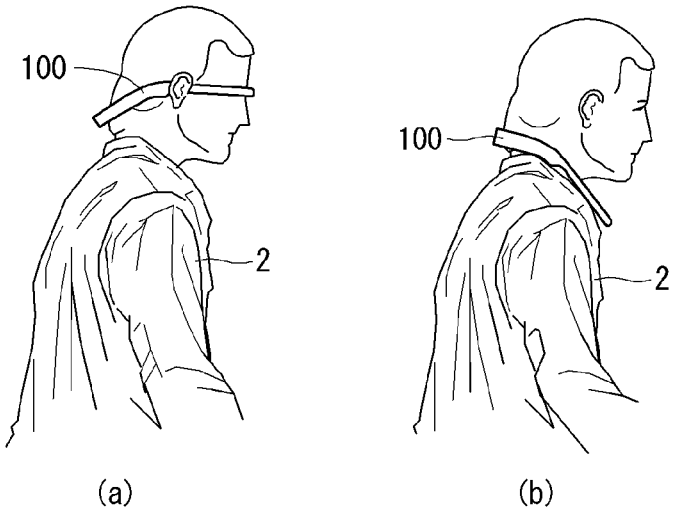


FIG. 4

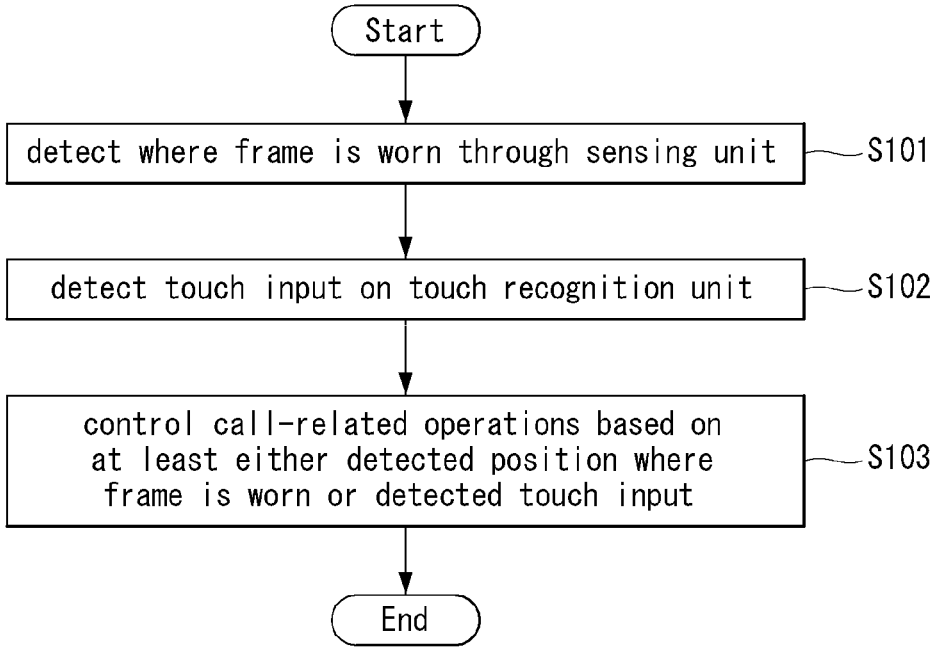

Start
detect where frame is worn through sensing unit
S101
detect touch input on touch recognition unit
S102
control call-related operations based on at least either detected position where frame is worn or detected touch input
S103
End

FIG. 5

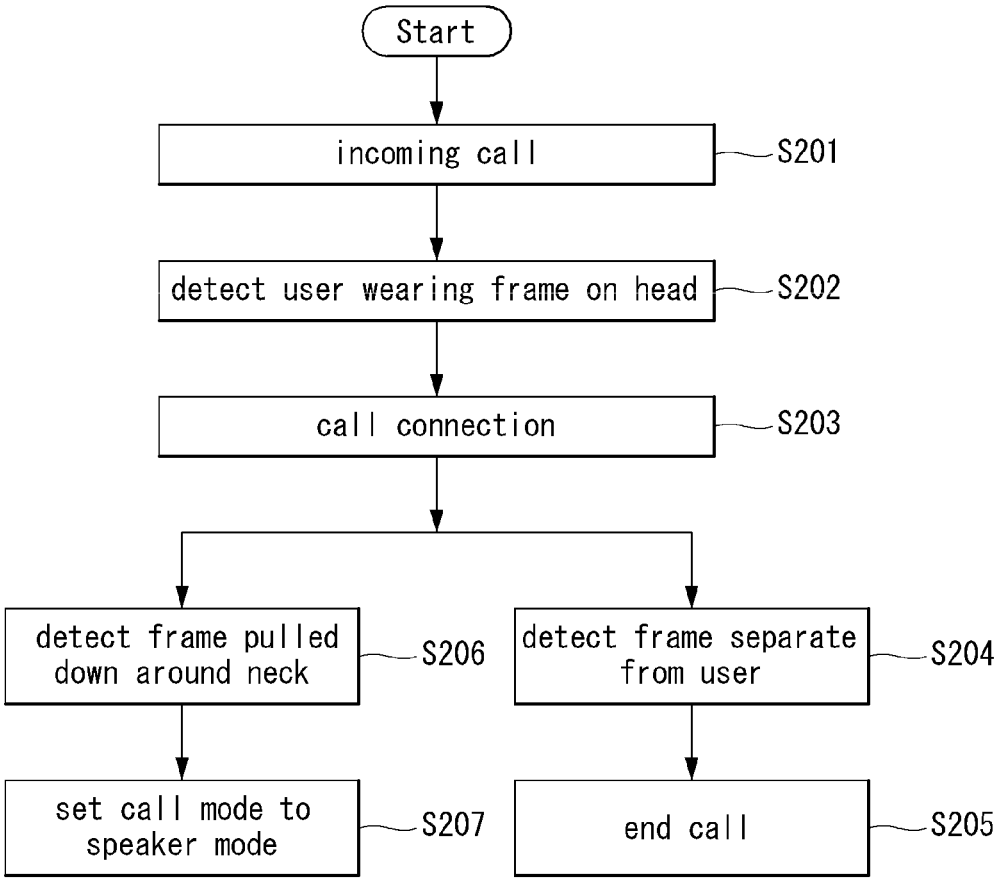

Start
incoming call
S201
detect user wearing frame on head
S202
call connection
S203
detect frame pulled down around neck
S206
detect frame separate from user
S204
set call mode to speaker mode
S207
end call
S205

FIG. 6

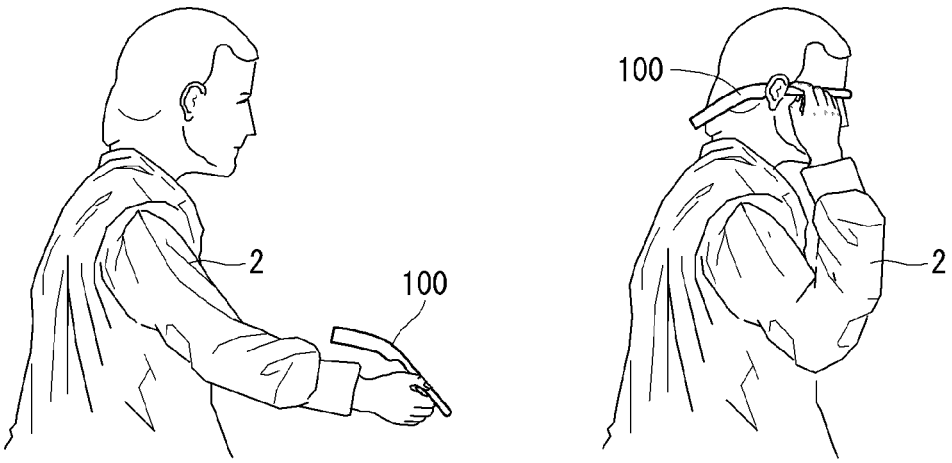


FIG. 7

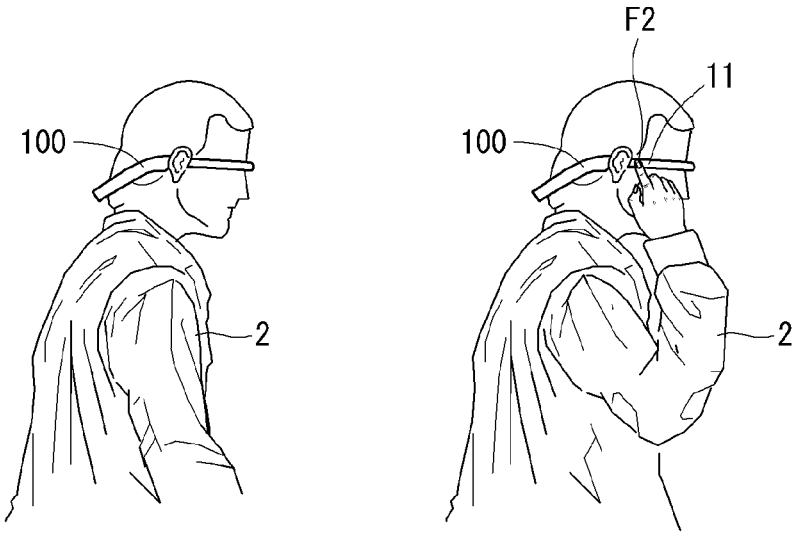


FIG. 8

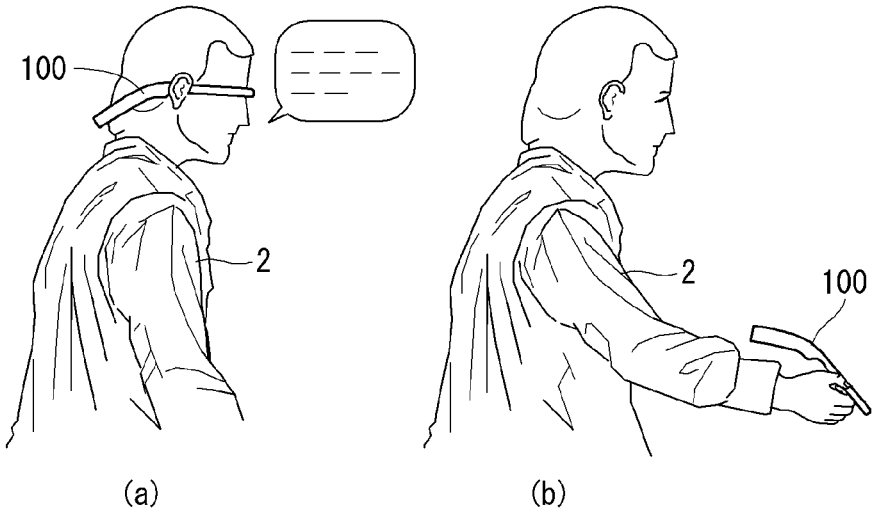


FIG. 9

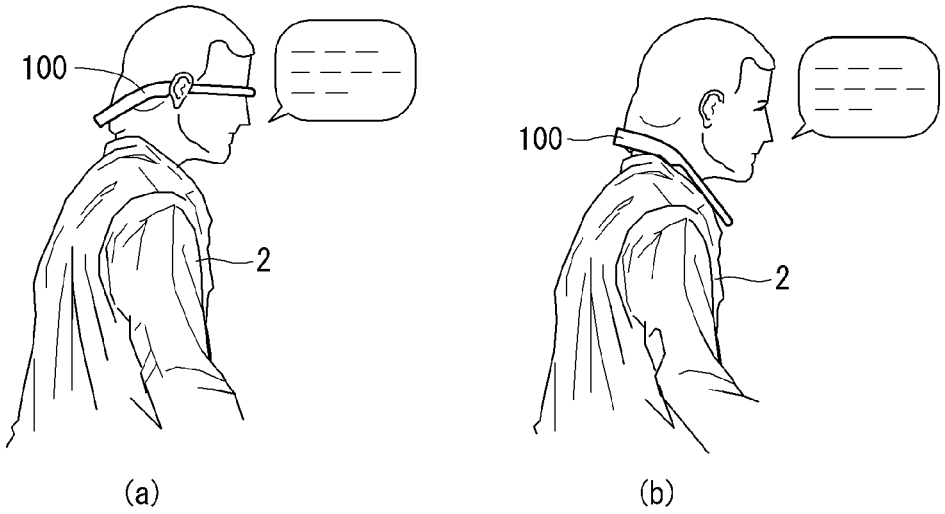


FIG. 10

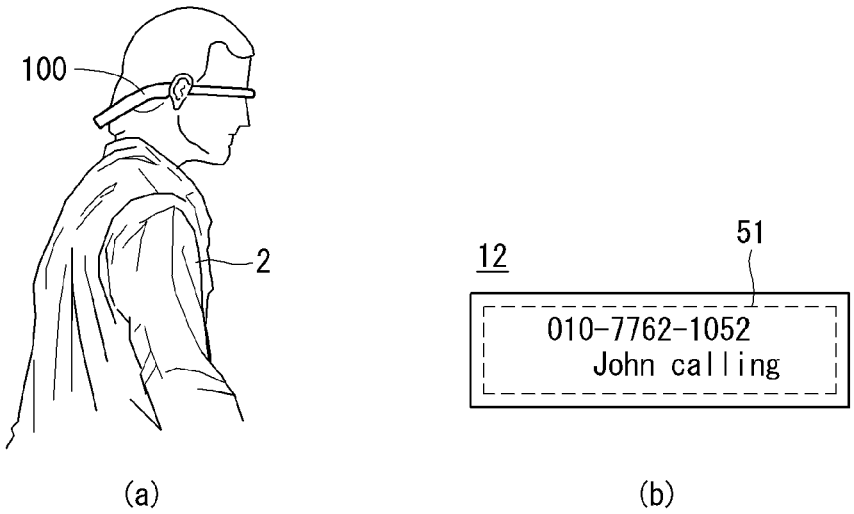
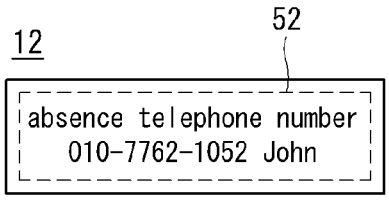
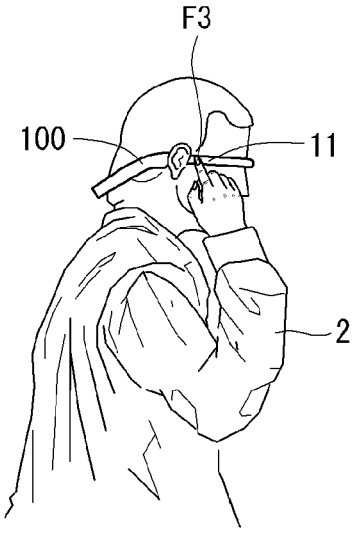


FIG. 11



(a)



(b)

FIG. 12

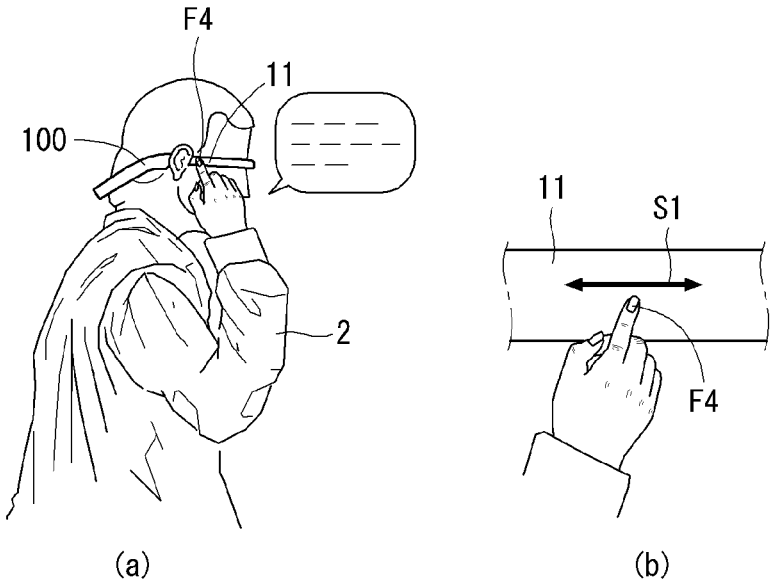


FIG. 13

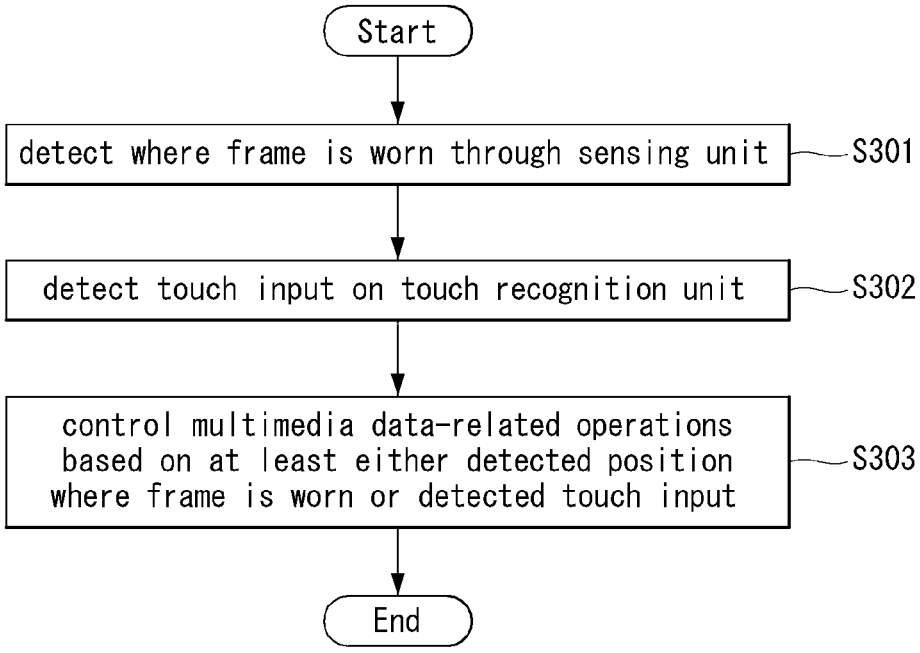

Start
detect where frame is worn through sensing unit
S301
detect touch input on touch recognition unit
S302
control multimedia data-related operations based on at least either detected position where frame is worn or detected touch input
S303
End

FIG. 14

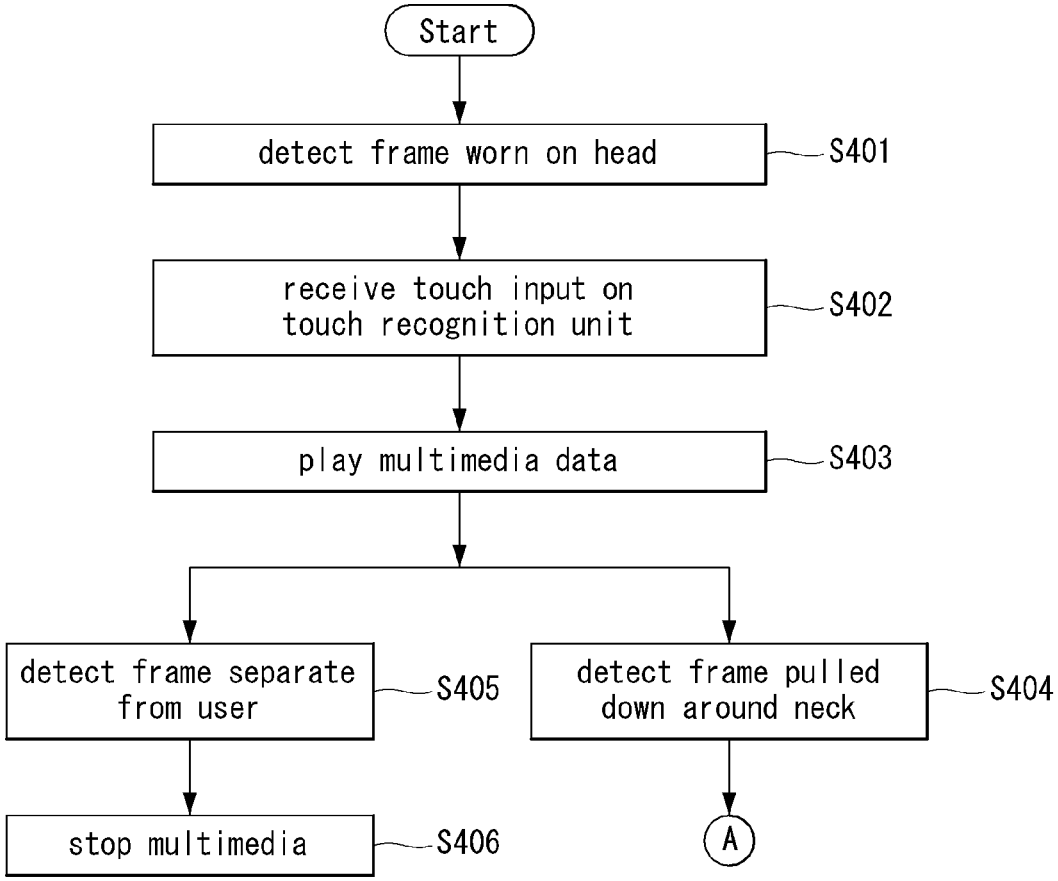
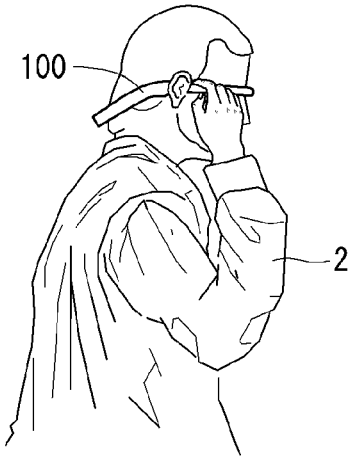
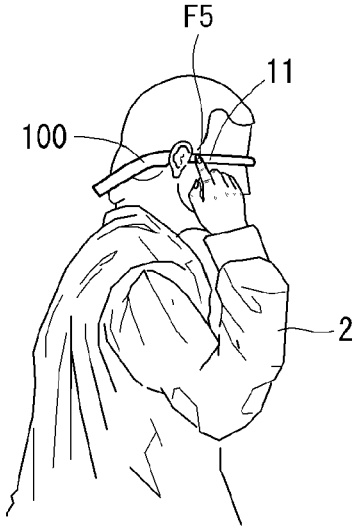

Start
detect frame worn on head
S401
receive touch input on touch recognition unit
S402
play multimedia data
S403
detect frame separate from user
S405
detect frame pulled down around neck
S404
stop multimedia
S406
A

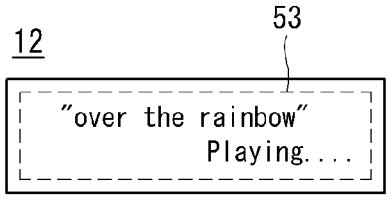
FIG. 15



(a)



(b)



(c)

FIG. 16

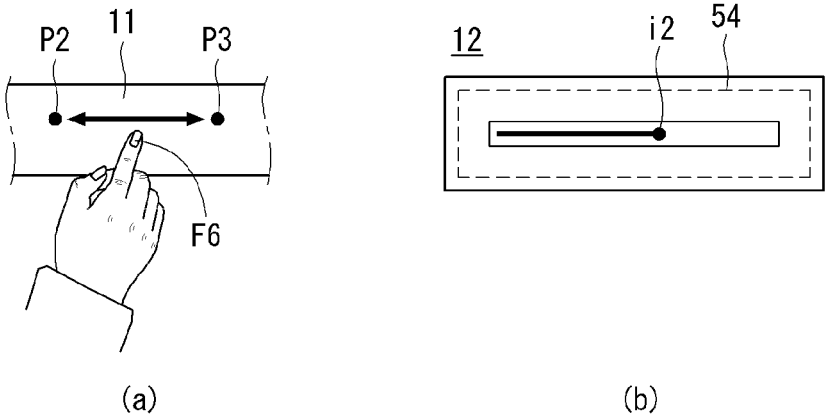


FIG. 17

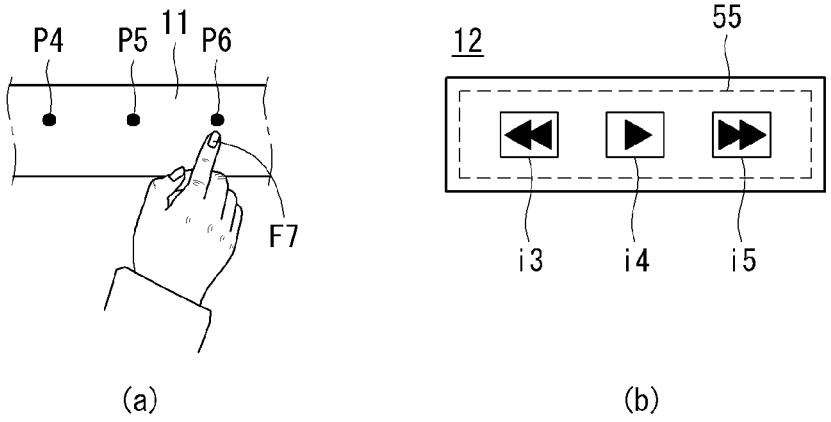
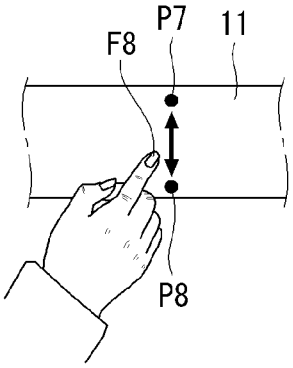
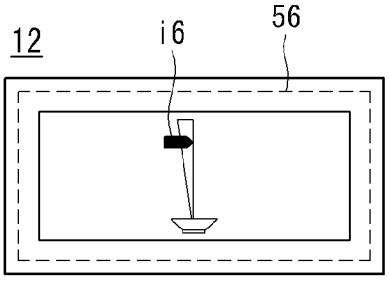


FIG. 18



(a)



(b)

FIG. 19

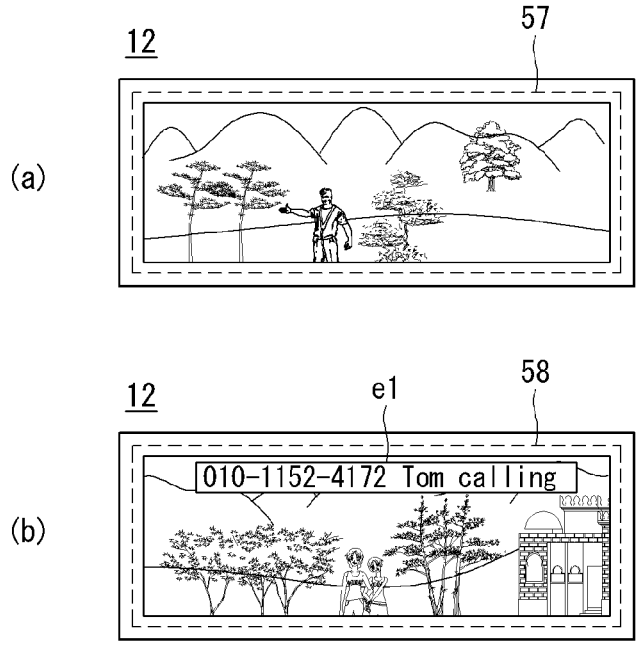


FIG. 20

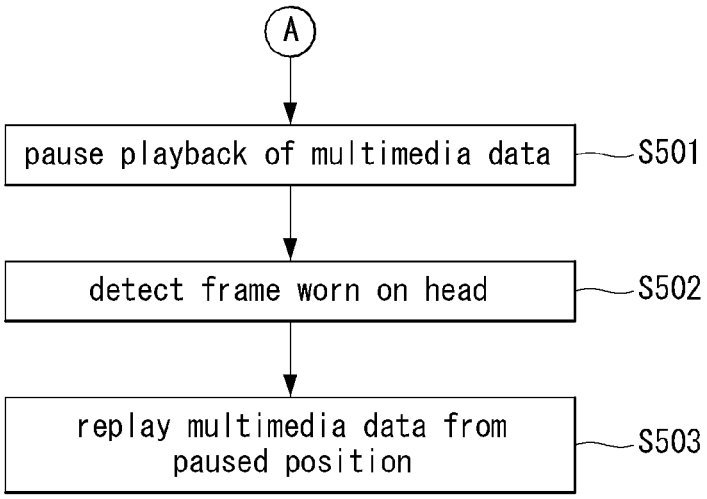

A
pause playback of multimedia data
S501
detect frame worn on head
S502
replay multimedia data from paused position
S503

FIG. 21

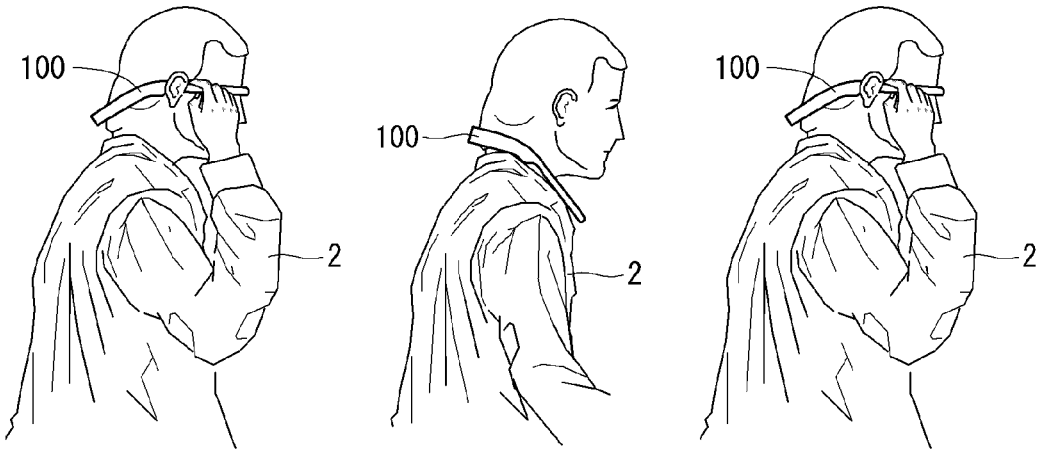
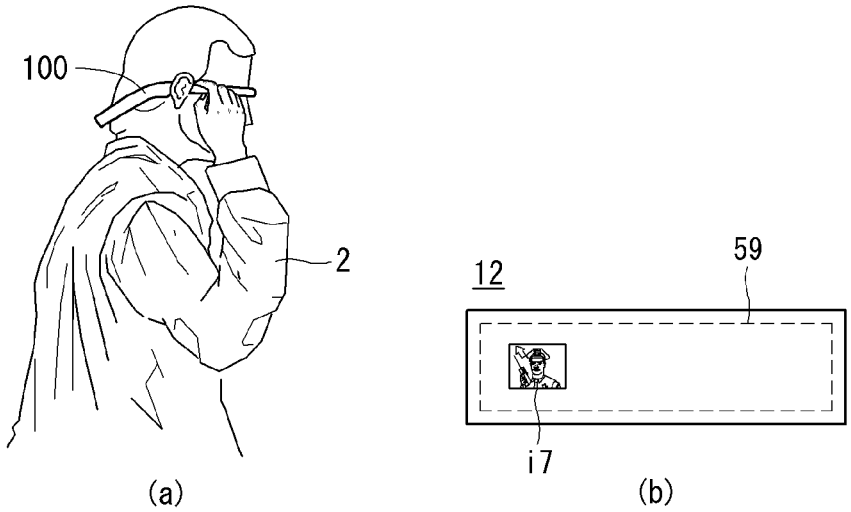


FIG. 22



WEARABLE ELECTRONIC DEVICE HAVING TOUCH RECOGNITION UNIT AND DETACHABLE DISPLAY, AND METHOD FOR CONTROLLING THE ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

Pursuant to 35 U.S.C. §119(a), this application claims the benefit of earlier filing date and right of priority to Korean Patent Application No. 10-2013-0111974, filed on Sep. 17, 2013, the contents of which are incorporated by reference herein in their entirety.

TECHNICAL FIELD

The present invention relates to an electronic device including a frame that a user can wear on the body, and more particularly, an electronic device whose operation is controlled according to which part of the body the user wears the frame on, and a control method thereof.

DISCUSSION OF THE RELATED ART

As functions of terminals such as personal computers, laptop computers, cellular phones diversify, the terminals become multimedia players having multiple functions for capturing pictures or moving images, playing music, moving image files and games and receiving broadcasting programs.

Terminals can be categorized as mobile terminals and stationary terminals. The mobile terminals can be further comprised of handheld terminals and vehicle mount terminals according to whether users can personally carry the terminals. Conventional terminals including mobile terminals provide an increasing number of complex and various functions.

To support and enhance the increasing number of functions in a terminal, improving a structural part and/or a software part of the terminal would be desirable. As various terminals including a mobile terminal provide a variety of complicated functions, menu structures also become complicated. Furthermore, a function of displaying digital documents including web pages through a terminal is added.

Recently, there is a demand for the development of wearable electronic devices.

SUMMARY

An object of the present invention is to provide an electronic device whose operation is controlled according to which part of the body the user wears the frame on, and a control method thereof. It is to be understood that technical objects to be achieved by the present invention are not limited to the aforementioned technical object and other technical objects which are not mentioned herein will be apparent from the following description to one of ordinary skill in the art to which the present invention pertains.

To accomplish the above object, an embodiment of the present invention provides an electronic device including a frame that a user can wear on the body, the electronic device including: a touch recognition unit provided on at least one side of the frame; a sensing unit that detects where the frame is worn; and a controller that detects, through the sensing unit, at least one of a first position where the frame is worn on the user's head, a second position where the frame is worn around the user's neck, and a third position where the frame is separate from the user, detects a touch input on the touch recognition unit, and controls call-related operations based on at least either the detected position where the frame is worn or the detected touch input.

If the detected position where the frame is worn changes from the second or third position to the first position while a call is coming in, the controller may connect to the call.

If the user is detected wearing the frame on the first position when there is an incoming call, the controller may connect to the call upon receiving a touch input on the touch recognition unit in a pattern preset for connecting to the call.

If the user is detected wearing the frame on the third position during the call, the controller may end the call.

If the user is detected wearing the frame on the second position during the call, the controller may set the call mode to speaker mode.

Upon receiving a touch input on the touch recognition unit in a pattern preset for ignoring the call while the call is coming in, the controller may ignore the call.

The electronic device may further include a display that is attachable and detachable to and from one end of the frame, and if the detected position where the frame is worn is the first position and the display is attached to the frame, the controller may display caller information of the incoming call on the display.

If the detected position where the frame is worn is the first position, the controller may transmit a call connection request to the number of the most recent incoming call upon receiving a touch input on the touch recognition unit in a pattern preset for a call connection request. The electronic device may further include a sound output unit including a bone conduction speaker, and the controller may adjust the volume of the sound output unit upon receiving a scroll input on the touch recognition unit.

To accomplish the above object, another embodiment of the present invention provides an electronic device including a frame that a user can wear on the body, the electronic device including: a touch recognition unit provided on at least one side of the frame; a memory that stores multimedia data; a sensing unit that detects where the frame is worn; and a controller that detects, through the sensing unit, at least one of a first position where the frame is worn on the user's head, a second position where the frame is worn around the user's neck, and a third position where the frame is separate from the user, detects a touch input on the touch recognition unit, and controls multimedia data-related operations based on at least either the detected position where the frame is worn or the detected touch input.

The electronic device may further include a sound output unit including a bone conduction speaker, and if the detected position where the frame is worn is the first position, the controller may play the multimedia through the sound output unit upon receiving a touch input on the touch recognition unit in a pattern preset for playing multimedia data.

Upon receiving a scroll input on the touch recognition unit, the controller may change the playback position of the currently playing multimedia data.

Upon receiving a scroll input on the touch recognition unit, the controller may adjust the volume of the sound output unit.

The electronic device may further include a display that is attachable and detachable to and from one end of the frame, and the controller may display at least either the title, playback position, or volume of the currently playing multimedia data.

If the detected position where the frame is worn is the second position during the playback of the multimedia data, the controller may pause the playback.

If the detected position where the frame is worn is the first position during the pause of the multimedia data, the controller may replay the multimedia data from the paused position.

The electronic device may further include a display that is attachable and detachable to and from one end of the frame, and if the currently playing multimedia data includes image data and the display is attached to the frame, the controller may output the image data on the display.

If the display is detached from the frame during the playback of the multimedia data, the controller may pause the playback of the multimedia data.

If the display is attached to the frame during the playback of the multimedia data, the controller may display a thumbnail image of the image data for the paused point in time on the display.

To accomplish the above object, another embodiment of the present invention provides a control method of an electronic device including a frame that a user can wear on the body, the control method including: detecting at least one of a first position where the frame is worn on the user's head, a second position where the frame is worn around the user's neck, and a third position where the frame is separate from the user; detecting a touch input on the touch recognition unit; and controlling call-related operations based on at least either the detected position where the frame is worn or the detected touch input.

In the controlling of call-related operations, if the detected position where the frame is worn changes from the second or third position to the first position while a call is coming in, the call may be connected.

The electronic device and the control method thereof according to the present invention have the following advantages.

According to the present invention, a variety of call-related or multimedia data-related functions can be used efficiently by changing the position where a frame wearable around the neck or on the head is worn.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention.

FIG. **1** is a block diagram of an electronic device according to an embodiment of the present invention.

FIG. **2** is a perspective view of an electronic device according to an embodiment of the present invention.

FIG. **3** illustrates an example of parts where an electronic device according to one embodiment of the present invention is worn.

FIG. **4** is a flowchart showing a control method of an electronic device according to a first embodiment of the present invention.

FIG. **5** is a flowchart for explaining the control of call-related operations according to the first embodiment of the present invention.

FIGS. **6** to **12** are views for explaining the control of call-related operations according to the first embodiment of the present invention.

FIG. **13** is a flowchart of a control method of an electronic device according to a second embodiment of the present invention.

FIG. **14** is a flowchart for explaining the control of multimedia data-related operations according to the second embodiment of the present invention.

FIGS. **15** to **19** are views for explaining the control of multimedia data-related operations according to the second embodiment of the present invention.

FIG. **20** is a flowchart for explaining another example of the control of multimedia data-related operations according to the second embodiment of the present invention.

FIGS. **21** and **22** are flowcharts for explaining another example of the control of multimedia data-related operations according to the second embodiment of the present invention.

DETAILED DESCRIPTION

The above and other aspects, features and advantages of the present disclosure will be more apparent from the following detailed description taken in conjunction with the accompanying drawings. As the invention allows for various changes and numerous embodiments, a particular embodiment will be illustrated in the drawings and described in detail in the written description. Like reference numerals refer to like elements throughout the specification. In describing the present disclosure, detailed descriptions of well-known functions or configurations will be omitted in order to not necessarily obscure the subject matter of the present disclosure. Numerals (e.g., first, second, etc.) used in the description of the present invention are only for distinguishing one element from another element.

An electronic device according to the present invention may be described below with reference to the accompanying drawings. In the following description, suffixes "module" and "unit" may be given to components of the electronic device in consideration of only facilitation of description and do not have meanings or functions discriminated from each other.

The electronic device may include a cellular phone, a smart phone, a laptop computer, a digital broadcasting terminal, personal digital assistants (PDA), a portable multimedia player (PMP), a navigation system and/or so on. It should be apparent to those skilled in the art that a configuration according to an embodiment disclosed in this specification should be applicable to fixed or stationary terminals, such as a digital TV or a desktop computer, except for applications disclosed to be specific only to a mobile terminal.

FIG. **1** is a block diagram of an electronic device according to an embodiment of the present invention.

The electronic device **100** may include a wireless communication unit **110** (or radio communication unit), an audio/video (A/V) input unit **120**, a user input unit **130**, a sensing unit **140**, an output unit **150**, a memory **160**, an interface **170**, a controller **180**, and a power supply unit **190**. The components shown in FIG. **1** are not essential parts and the number of components included in the electronic device **100** can be varied. Components of the electronic device **100** may now be described.

The wireless communication unit **110** may include at least one module that enables radio communication between the electronic device **100** and a radio communication system or between the electronic device **100** and a network in which the electronic device **100** is located. For example, the wireless communication unit **110** may include a broadcasting receiving module **111**, a mobile communication module **112**, a wireless Internet module **113**, a short range communication module **114** (or local area communication module), and a location information module **115** (or position information module).

The broadcasting receiving module **111** may receive broadcasting signals and/or broadcasting related information from an external broadcasting management server through a broadcasting channel.

The broadcasting channel may include a satellite channel and a terrestrial channel, and the broadcasting management server may be a server that generates and transmits broadcasting signals and/or broadcasting related information or a server that receives previously created broadcasting signals and/or broadcasting related information and transmits the broadcasting signals and/or broadcasting related information to a terminal. The broadcasting signals may include not only TV broadcasting signals, radio broadcasting signals, and data broadcasting signals but also signals in the form of a combination of a TV broadcasting signal and a radio broadcasting signal.

The broadcasting related information may be information on a broadcasting channel, a broadcasting program or a broadcasting service provider, and may be provided even through a mobile communication network. In the latter case, the broadcasting related information may be received by the mobile communication module **112**.

The broadcasting related information may exist in various forms. For example, the broadcasting related information may exist in the form of an electronic program guide (EPG) of a digital multimedia broadcasting (DMB) system or in the form of an electronic service guide (ESG) of a digital video broadcast-handheld (DVB-H) system.

The broadcasting receiving module **111** may receive broadcasting signals using various broadcasting systems. More particularly, the broadcasting receiving module **111** may receive digital broadcasting signals using digital broadcasting systems such as a digital multimedia broadcasting-terrestrial (DMB-T) system, a digital multimedia broadcasting-satellite (DMB-S) system, a media forward link only (MediaFLO) system, a DVB-H and integrated services digital broadcast-terrestrial (ISDB-T) systems. The broadcasting receiving module **111** may receive signals from broadcasting systems providing broadcasting signals other than the above-described digital broadcasting systems.

The broadcasting signals and/or broadcasting related information received through the broadcasting receiving module **111** may be stored in the memory **160**.

The mobile communication module **112** may transmit/receive a radio signal to/from at least one of a base station, an external terminal and a server on a mobile communication network. The radio signal may include a voice call signal, a video telephony call signal or data in various forms according to transmission and reception of text/multimedia messages.

The wireless Internet module **113** may correspond to a module for wireless Internet access and may be included in the electronic device **100** or may be externally attached to the electronic device **100**. Wireless LAN (WLAN or Wi-Fi), wireless broadband (Wibro), world interoperability for microwave access (Wimax), high speed downlink packet access (HSDPA) and so on may be used as a wireless Internet technique.

The short range communication module **114** may correspond to a module for short range communication. Further, Bluetooth®, radio frequency identification (RFID), infrared data association (IrDA), ultra wideband (UWB) and/or ZigBee® may be used as a short range communication technique.

The location information module **115** is a module for identifying or otherwise obtaining the location of an electronic device. A global positioning system (GPS) module is a representative example of the location information module **115**. According to the current technology, the GPS module **115** may calculate information on distances between one point or object and at least three satellites and information on a time when distance information is measured and apply trigonometry to the obtained distance information to obtain three-dimensional position information on the point or object according to latitude, longitude and altitude at a predetermined time. A method of calculating position and time information using three satellites and correcting the calculated position and time information using another satellite may also be used. Additionally, the GPS module **115** may continuously calculate a current position in real time and calculate velocity information using the location or position information.

Referring to FIG. **1**, the A/V input unit **120** may input (or receive) an audio signal and/or a video signal. The A/V input unit **120** may include a camera **121** and a microphone **122**. The camera **121** may process image frames of still images or moving images obtained by an image sensor in a video telephony mode or a photographing mode. The processed image frames may be displayed on a display module **151**.

The image frames processed by the camera **121** may be stored in the memory **160** or may be transmitted to an external device through the wireless communication unit **110**. The electronic device **100** may also include at least two cameras **121**.

The microphone **122** may receive an external audio signal in a call mode, a recording mode and/or a speech recognition mode, and the microphone **122** may process the received audio signal into electric audio data. The audio data may then be converted into a form that can be transmitted to a mobile communication base station through the mobile communication module **112** and output in the call mode. The microphone **122** may employ various noise removal algorithms (or noise canceling algorithm) for removing or reducing noise generated when the external audio signal is received.

The user input unit **130** may receive input data for controlling operation of the electronic device **100** from a user. The user input unit **130** may include a keypad, a dome switch, a touch pad (constant voltage/capacitance), a jog wheel, a jog switch and/or so on.

The sensing unit **140** may sense a current state of the electronic device **100**, such as an open/close state of the electronic device **100**, a position of the electronic device **100**, whether a user touches the electronic device **100**, a direction of the electronic device **100**, and acceleration/deceleration of the electronic device **100**, and the sensing unit **140** may generate a sensing signal for controlling operation of the electronic device **100**. For example, if the electronic device **100** is a slide phone, the sensing unit **140** may sense whether the slide phone is opened or closed. Further, the sensing unit **140** may sense whether the power supply unit **190** supplies power and/or whether the interface **170** is connected to an external device. Meanwhile, the sensing unit **140** may include a posture detection sensor **141** and/or a proximity sensor **142**.

The output unit **150** may generate visual, auditory and/or tactile output, and the output unit **150** may include the display module **151**, an audio output module **152**, an alarm **153** and a haptic module **154**. The display module **151** may display information processed by the electronic device **100**. The display module **151** may display a user interface (UI) and/or a graphic user interface (GUI) related to a telephone call when the electronic device **100** is in the call mode. The display module **151** may also display a captured and/or received image, a UI or a GUI when the electronic device **100** is in the video telephony mode or the photographing mode.

The display module **151** may include at least one of a liquid crystal display, a thin film transistor liquid crystal display, an organic light-emitting diode display, a flexible display and/or a 3D display. Some of the above displays may be configured

as a transparent or light transmissive type display through which the outside may be viewed. This may be called "transparent display".

An example of the transparent display includes a transparent LCD. A rear structure of the display module **151** may also be of a light transmissive type. Accordingly, a user may see an object located behind the body (of the electronic device **100**) through the transparent area of the body of the electronic device **100** is occupied by the display module **151**.

The electronic device **100** may also include at least two displays **151**. For example, the electronic device **100** may include a plurality of displays **151** that are arranged on a single face at a predetermined distance or integrated displays. The plurality of displays **151** may also be arranged on different sides.

When the display module **151** and a sensor sensing touch (hereafter, referred to as a touch sensor) form a layered structure (hereinafter, referred to as a touch screen), the display module **151** may be used as an input device in addition to an output device. The touch sensor may be in the form of a touch film, a touch sheet, and/or a touch pad, for example.

The touch sensor may convert a variation in pressure applied to a specific portion of the display module **151** or a variation in capacitance generated at a specific portion of the display module **151** into an electric input signal. The touch sensor may sense pressure of touch as well as position and area of the touch.

When the user applies a touch input to the touch sensor, a signal (signals) corresponding to the touch input may be transmitted to a touch controller. The touch controller may then process the signal(s) and transmit data corresponding to the processed signal(s) to the controller **180**. Accordingly, the controller **180** may detect a touched portion of the display module **151**.

Referring to FIG. **1**, the proximity sensor may be located in an internal region of the electronic device **100**, surrounded by the touch screen, and/or near the touch screen. The proximity sensor may sense an object approaching a predetermined sensing face or an object located near the proximity sensor using an electromagnetic force or infrared rays without having mechanical contact. The proximity sensor may have a lifetime longer than a contact sensor and may thus have a wide application in the electronic device **100**.

The proximity sensor may include a transmission type photo-electric sensor, a direct reflection type photo-electric sensor, a mirror reflection type photo-electric sensor, a high-frequency oscillating proximity sensor, a capacitive proximity sensor, a magnetic proximity sensor, and/or an infrared proximity sensor. A capacitive touch screen may be constructed such that proximity of a pointer is detected through a variation in an electric field according to the proximity of the pointer. The touch screen (touch sensor) may be classified as a proximity sensor.

For ease of explanation, an action of the pointer approaching the touch screen without actually touching the touch screen may be referred to as a proximity touch and an action of bringing the pointer into contact with the touch screen may be referred to as a contact touch. The proximity touch point of the pointer on the touch screen may correspond to a point of the touch screen at which the pointer is perpendicular to the touch screen.

The proximity sensor may sense the proximity touch and a proximity touch pattern (e.g., a proximity touch distance, a proximity touch direction, a proximity touch velocity, a proximity touch time, a proximity touch position, a proximity touch moving state, etc.). Information corresponding to the sensed proximity touch action and proximity touch pattern may then be displayed on the touch screen.

The audio output module **152** may output audio data received from the wireless communication unit **110** or stored in the memory **160** in a call signal receiving mode, a telephone call mode or a recording mode, a speech recognition mode and a broadcasting receiving mode. The audio output module **152** may output audio signals related to functions, such as a call signal incoming tone and a message incoming tone, performed in the electronic device **100**. The audio output module **152** may include a receiver, a speaker, a buzzer, and/or the like.

The alarm **153** may output a signal for indicating generation of an event of the electronic device **100**. For example, an alarm may be generated when receiving a call signal, receiving a message, inputting a key signal, and/or inputting a touch. The alarm **153** may also output signals in forms different from video signals or audio signals, for example, a signal for indicating generation of an event through vibration. The video signals and/or the audio signals may also be output through the display module **151** or the audio output module **152**.

The haptic module **154** may generate various haptic effects that the user can feel. One example of the haptic effects is vibration. An intensity and/or pattern of vibration generated by the haptic module **154** may also be controlled. For example, different vibrations may be combined and output or may be sequentially output.

The haptic module **154** may generate a variety of haptic effects including an effect of stimulus according to an arrangement of pins vertically moving against a contact skin surface, an effect of stimulus according to a jet force or sucking force of air through a jet hole or a sucking hole, an effect of stimulus of rubbing the skin, an effect of stimulus according to contact of an electrode, an effect of stimulus using an electrostatic force, and an effect according to a reproduction of cold and warmth using an element capable of absorbing or radiating heat in addition to vibrations.

The haptic module **154** may not only transmit haptic effects through direct contact but may also allow the user to feel haptic effects through a kinesthetic sense of the user's fingers or arms. The electronic device **100** may also include a plurality of haptic modules **154**.

The memory **160** may store a program for operations of the controller **180** and/or temporarily store input/output data such as a phone book, messages, still images, and/or moving images. The memory **160** may also store data about vibrations and sounds in various patterns that are output from when a touch input is applied to the touch screen.

The memory **160** may include at least a flash memory, a hard disk type memory, a multimedia card micro type memory, a card type memory, such as SD or XD memory, a random access memory (RAM), a static RAM (SRAM), a read-only memory (ROM), an electrically erasable programmable ROM (EEPROM), a programmable ROM (PROM) magnetic memory, a magnetic disk and/or an optical disk. The electronic device **100** may also operate in relation to a web storage that performs a storing function of the memory **160** on the Internet.

The interface **170** may serve as a path to external devices connected to the electronic device **100**. The interface **170** may receive data from the external devices or power and transmit the data or power to internal components of the electronic device **100** or transmit data of the electronic device **100** to the external devices. For example, the interface **170** may include a wired/wireless headset port, an external charger port, a wired/wireless data port, a memory card port, a port for con-

necting a device having a user identification module, an audio I/O port, a video I/O port, and/or an earphone port.

The user identification module is a chip that stores information for authenticating authority to use the electronic device **100**. For example, the user identification module may be a user identify module (UIM), a subscriber identify module (SIM) and/or a universal subscriber identify module (USIM). An identification device (including the user identification module) may also be manufactured in the form of a smart card. Accordingly, the identification device may be connected to the electronic device **100** through a port.

The interface **170** may also be a path through which power from an external cradle is provided to the electronic device **100** when the electronic device **100** is connected to the external cradle or a path through which various command signals input by the user through the cradle are transmitted to the electronic device **100**. The various command signals or power input from the cradle may be used as signals for confirming whether the electronic device **100** is correctly set in the cradle.

The controller **180** may control overall operations of the electronic device **100**. For example, the controller **180** may perform control and processing for voice communication, data communication and/or video telephony. The controller **180** may also include a multimedia module **181** for playing multimedia. The multimedia module **181** may be included in the controller **180** or may be separated from the controller **180**.

The controller **180** may perform a pattern recognition process capable of recognizing handwriting input or picture-drawing input applied to the touch screen as characters or images. The power supply unit **190** may receive external power and internal power and provide power required for operations of the components of the electronic device **100** under control of the controller **180**. The various embodiments described herein may be implemented as software, hardware, or a combination thereof in a storage medium that may be read by a computer or a similar device thereof.

According to hardware implementation, embodiments may be implemented using at least one of application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, and/or electrical units for executing functions. Embodiments may be implemented by the controller **180**.

According to software implementation, embodiments such as procedures or functions may be implemented with a separate software module that executes at least one function or operation. Software codes may be implemented according to a software application written in an appropriate software language. The software codes may be stored in the memory **160** and executed by the controller **180**.

FIG. **2** is a perspective view of an electronic device **100** according to an embodiment of the present invention.

Referring to FIG. **2**, the electronic device **100** may be implemented as a band-shaped frame **10** with some or all of the components of FIG. **1** integrated in it.

The electronic device **100** may include a frame **10**, a touch recognition unit **11**, a display **12**, a bone conduction speaker **13**, a high-sensitive microphone **14**, a camera **15**, a PCB **16**, an angle adjustment **17**, a guide slot **18**, and a battery **19**. The components shown in FIG. **2** are not essential parts and the number of components included in the electronic device **100** can be varied.

The components of the electronic device **100** may now be described.

The electronic device **100** may be implemented as a band-shaped frame **10** that a user can wear on the head or neck. The frame **10** may be made of a shape memory alloy. The inside of the frame **10**, a region that comes in contact with the user's head or neck, may be made of non-irritating silicon.

The electronic device **100** may be equipped with the touch recognition unit **11** on one side or both sides of the frame **10**. The touch sensor **170** explained in FIG. **1** may recognize a touch input on the touch recognition unit **11**. Touch input data through the touch recognition unit **11** may be used to perform a particular function of the electronic device **100**.

The display **12** may be made to be attachable and detachable to and from an end of the frame **10**. The display **12** may be transparent like normal glasses, and the user can look ahead through it by wearing the electronic device **100** on the head. Also, the display **12** may serve as a transparent display for providing information.

While the electronic device **100** of FIG. **2** includes the display **12** on one end of the frame **10**, it may include the display **12** on the other end. In another embodiment, the electronic device **100** may include two displays **12**—one on either end of the frame **10**.

The electronic device **100** may include at least one bone conduction speaker **13** on at least one side of the frame **10**. The bone conduction speaker **13** may be placed in close proximity to the ears, that is, on both sides of the frame **10**, with the electronic device **100** worn on the user's head.

The bone conduction speaker **13** is a speaker that delivers sounds through bone conduction. Based on the principle that humans can perceive and hear sounds both through the ears and through the body (especially, vibrations through bones and blood), the bone conduction speaker **13** allows the user to recognize sounds by sending sound waves to the skull and then into the inner ear.

The electronic device **100** may include the high-sensitive microphone **14**. In one embodiment of the present invention, the high-sensitive microphone **14** may be mounted on the side of the frame **10** so that it is placed in close proximity to the side of the user's face, i.e., mouth, with the electronic device **100** worn on the head.

The electronic device **100** may be equipped with the camera **15** on one end of the frame **10**. The camera **15** is used to take images ahead of the electronic device **100**, and can be rotated to a certain angle up, down, left, or right. The camera **15** may be used to take images of the face or eyes of the user wearing the electronic device **100**.

While the electronic device **100** of FIG. **2** includes the camera **15** on one end of the frame **10**, it may include the camera **15** on the other end. In another embodiment, the electronic device **100** may include a plurality of cameras on other sides of the frame **10**.

The electronic device **100** may be equipped with the angle adjustment **17** on one end or both ends of the frame **10**. When the user is wearing the electronic device **100** on the head or neck, the angle adjustment **17** can be adjusted to a certain angle up or down for comfortable wearing.

The electronic device **100** may be equipped with the guide slot **18** on both sides of the frame **10**. In order for the user to wear the electronic device **100** on the head, a slot structure may be formed on both sides of the frame **10**, i.e., where the user's ears should be. Accordingly, the user can wear the electronic device **100** as well while wearing normal glasses.

The electronic device **100** may be equipped with a battery **19** for supplying power to the electronic device **100** on the back side of the frame **10**. That is, the battery **19** according to one embodiment of the present invention may be incorporated in the electronic device **100**.

As described above, it is apparent that the shape of the electronic device **100** according to an embodiment of the present invention is not limited to the example shown in FIG. **2**.

FIG. **3** illustrates an example of parts where an electronic device according to one embodiment of the present invention is worn.

As shown in (a) of FIG. **3**, the electronic device **100** may be worn on the head of the user **2**. Both sides of the frame **10** implemented in a band shape may be worn in such a way as to hang on the ears of the user **2**.

As shown in (b) of FIG. **3**, the electronic device **100** may be worn around the neck of the user **2**. That is, the band-shaped frame **10** may be worn in such a way as to hang around the neck of the user **2**.

The user may wear the band-shaped frame **10** around the neck at normal times and on the head when executing a particular function. Also, it is needless to say that the user may wear the frame **10** on the head at normal times and pull it down around the neck when executing a particular function.

That is, the electronic device **100** may detect where the frame **10** is worn and control the operation of the electronic device **100**.

FIG. **4** is a flowchart showing a control method of an electronic device according to a first embodiment of the present invention.

The electronic device **100** according to an embodiment of the present invention may include a sensing unit **140**. The sensing unit **140** explained in FIG. **1** may detect where the user is wearing the electronic device **100** and generate a sensing signal for controlling the operation of the electronic device **100**. That is, the sensing unit **140** may detect whether the user is wearing the electronic device **100** on the head or around the neck or whether the electronic device **100** is separate from the user or not. The sensing unit **140** may include a gyro sensor and an acceleration sensor.

The controller **180** of the electronic device **100** according to the embodiment of the present invention may detect where the frame **10** is worn, through the sensing unit **140** (S**101**). That is, the controller **180** may detect, through the sensing unit **140**, at least one of a first position where the frame **10** is worn on the user's head, a second position where the frame **10** is worn around the user's neck, and a third position where the frame **10** is separate from the user.

The controller **180** according to the embodiment of the present invention may detect a touch input on the touch recognition unit **11** (S**102**). The touch input on the touch recognition unit **11** may occur by hand contact with the touch recognition unit **11**.

In another embodiment, the touch input on the touch recognition unit **11** may occur as the user does a touch input (e.g., double-touch, scroll, etc) in a preset pattern to execute a particular function.

The controller **180** according to the embodiment of the present invention may control call-related operations based on at least either the detected position where the frame **10** is worn or the detected touch input (S**103**).

Upon an incoming call, the controller **180** may detect where the frame **10** is worn, detect a touch input on the touch recognition unit **11**, and control operations such as connecting to the incoming call or ending the call.

FIG. **5** is a flowchart for explaining the control of call-related operations according to the first embodiment of the present invention.

That is, FIG. **5** is a flowchart for explaining in more detail an example where call-related operations are controlled depending on where the frame **10** is worn.

The controller **180** may have an incoming call (S**201**). If the user is detected wearing the frame **10** on the head, the controller **180** may connect to the incoming call (S**202** and S**203**). That is, upon an incoming call, the user may connect to the call by wearing the electronic device **100** on the head.

Upon detecting the frame **10** separate from the user, the controller **180** according to the embodiment of the present invention may end the call (S**204** and S**205**). That is, when the user wants to end a call connection during the call, they may end the call by separating the frame **10** from the head.

Upon detecting the frame **10** pulled down around the neck, the controller **180** according to the embodiment of the present invention may set the call mode for the connected call to speaker mode (S**206** and S**207**). That is, the controller **180** may switch the call from call mode to speaker mode by wearing the frame **10** around the neck during the call. In other words, the controller **180** may turn up the speaker and microphone volumes.

FIGS. **6** to **12** are views for explaining the control of call-related operations according to the first embodiment of the present invention.

As shown in (a) and (b) of FIG. **6**, the user **2** may wear the electronic device **100** on the head.

Upon detecting the frame **10** worn on the head when there is an incoming call, the electronic device **100** according to the first embodiment of the present invention may connect to the incoming call. That is, the electronic device **100** may operate in call mode.

This means that, when there is an incoming call while the user **2** is wearing the frame **10** around the neck or the frame **10** is separate from the user **20**, the user can connect to the call by wearing the frame **10** on the head.

FIG. **7** illustrates an example where there is an incoming call while the user **2** is wearing the electronic device **100** on the head. As shown in (a) and (b) of FIG. **7**, the user may do a touch input on the touch recognition unit **11** with a finger F2.

If the user **2** is wearing the frame **10** on the head while a call is coming in, the controller **180** may receive a touch input on the touch recognition unit **11** in a pattern preset for connecting to the call. The controller **180** may connect to the call based on the touch input.

For example, the touch input with the pattern preset for connecting to the call may involve touching the touch recognition unit **11** two times. The touch input pattern for connecting to the call may be preset on the electronic device **100**, or set or changed by the user.

FIG. **8** illustrates an example where the user **2** separates the electronic device **100** from the head during a call.

The controller **180** may end the call connection based on where the frame **10** is worn. That is, upon detecting the electronic device **100**, which the user has been wearing on the head, separate from the user during the call, the controller **180** may end call mode.

Also, the controller **180** may detect the direction where the electronic device **100**, separate from the user, is placed on a plane, etc. The controller **180** may control the operation of the electronic device **100** depending on the detected direction.

This means that the user can end the connected call during the call by separating the electronic device **100** from them.

FIG. **9** illustrates an example where the user **2** wears the electronic device **100** around the neck during a call.

The controller **180** may set call mode to speaker mode based on where the frame **10** is worn. That is, upon detecting the user wearing the electronic device **100**, which has been worn on the head, around the neck during the call, the controller **180** may switch call mode to speaker mode. The con-

troller **180** may turn the microphone and speaker volumes up so as to operate in speaker mode.

This means that the user is able to talk to the other party of the connected call while wearing the electronic device **100** around the neck.

FIG. **10** illustrates an example where caller information is displayed on the display **12** when there is an incoming call.

(a) of FIG. **10** illustrates an example where the user of the electronic device **100** wears the electronic device **100** on the head. As shown in (b) of FIG. **10**, when the user is wearing the electronic device **100** on the head, with the display **12** attached to it, the controller **180** may display predetermined information on the display **12**.

For example, the caller name and number **51** of the incoming call may be displayed on the display **12** ((b) of FIG. **10**).

FIG. **11** illustrates an example where a call connection request is transmitted if there is a missed call.

As shown in (a) of FIG. **11**, the number and caller name **52** of the missed call may be displayed on the display **12**.

As shown in (b) of FIG. **11**, the controller **180** may receive an input for touching the touch recognition unit **11** with a finger F3 from the user. Upon receiving a touch input in a pattern preset for a call connection request, the controller **180** may transmit a call connection request to the number of the most recent incoming call.

For example, the touch input with the pattern preset for a call connection request may involve touching the touch recognition unit **11** three times. The touch input pattern for a call connection request may be preset on the electronic device **100**, or set or changed by the user.

That is, the user may wear the electronic device **100** on the head and check the caller information of the missed call displayed on the display **12**. The user may transmit a call connection request to the caller's number by touching the touch recognition unit **11** three times.

FIG. **12** illustrates an example of volume control during a call.

As shown in (a) of FIG. **12**, the controller **180** may receive an input for touching the touch recognition unit **11** with a finger F4 when the electronic device **100** is wearing the electronic device **100** on the head.

(b) of FIG. **12** is an enlarged view illustrating the touch recognition unit **11** of the electronic device **100** of (a) of FIG. **12**. As shown herein, the controller **180** may receive an input s1 for scrolling the touch recognition unit **11** with the finger F4.

Upon receiving the input s1 for scrolling the touch recognition unit **11** during a call, the controller **180** may adjust the call volume. That is, the controller **180** may turn the volume of the speaker **13** up in response to an input for scrolling in one direction and turn the volume of the speaker **13** down in response to an input for scrolling in the other direction.

This means that volume control can be done by scrolling the touch recognition unit **11** provided on the side of the frame **10** while the user is talking on the phone, wearing the electronic device **100** on the head.

In another embodiment of the present invention, when there is an incoming call, if the controller **180** receives a touch input on the touch recognition unit **11** in a pattern preset for ignoring the call, the controller **180** may end the incoming call.

For example, the touch input with the pattern preset for ignoring the call may involve touching the touch recognition unit **11** long. The touch input pattern for ignoring the call may be preset on the electronic device **100**, or set or changed by the user.

FIG. **13** is a flowchart of a control method of an electronic device according to a second embodiment of the present invention.

The controller **180** of the electronic device **100** according to an embodiment of the present invention may detect where the frame **10** is worn through the sensing unit **140** (S**301**). Also, the controller **180** may detect a touch input on the touch recognition unit **11** (S**302**). The controller **180** may control multimedia data-related operations based on at least either the detected position where the frame **10** is worn or the detected touch input (S**303**).

The electronic device **100** may include a memory **160** that stores multimedia data. The multimedia data may include music files and video files.

That is, as the user wears the electronic device **100** on the head and does a touch input on the touch recognition unit **11**, the multimedia-related operations (e.g., play and stop) stored in the memory **160** may be executed.

FIG. **14** is a flowchart for explaining the control of multimedia data-related operations according to the second embodiment of the present invention.

That is, FIG. **14** is a flowchart for explaining in more detail an example where multimedia data-related operations are controlled depending on where the frame **10** is worn.

The controller **180** may detect the frame **10** worn on the user's head (S**401**). Also, the controller **180** may receive a touch input on the touch recognition unit **11** (S**402**). The controller **180** may play multimedia data based on at least either the detected position where the frame **10** is worn or the received touch input (S**403**).

The touch input on the touch recognition unit **11** may denote a touch input with a pattern preset for playing multimedia data. The touch input pattern for playing multimedia data may be preset on the electronic device **100**, or set or changed by the user. For example, the touch input for playing multimedia data may involve touching the touch recognition unit **11** once.

Upon detecting the frame **10** separate from the user (S**404**), the controller **180** may stop or pause the playback of multimedia data (S**405** and S**406**).

That is, while watching multimedia data (e.g., a music file), wearing the frame **10** on the head, the user may stop the playback of the multimedia data by separating the frame **10** from them.

FIGS. **15** to **19** are views for explaining the control of multimedia data-related operations according to the second embodiment of the present invention.

FIG. **15** illustrates an example of the playback of multimedia data.

As shown in (a) of FIG. **15**, the user **2** may wear the electronic device **100** on the head. As shown in (b) of FIG. **15**, the user may do a touch input on the touch recognition unit **11** of the electronic device **100** with a finger F5.

The controller **180** may play multimedia (e.g., a music file) based on at least either the position where the electronic device **100** is worn or the touch input on the touch recognition unit **11**.

(c) of FIG. **15** illustrates an example where the title **53** of the multimedia data (music file) is displayed on the display **12**. That is, with the display **12** attached to the frame **10**, the controller **180** may display information about the music file on the display **12** while the music file is playing.

FIG. **16** illustrates an example where the playback position of multimedia data is changed by a touch input on the touch recognition unit **11**.

(a) of FIG. **16** is an enlarged view illustrating the touch recognition unit **11** of the electronic device **100**. The control-

ler **180** may receive an input for scrolling between first and second points p2 and p3 of the touch recognition unit **11** with a finger F6.

The controller **180** may recognize any one point on the touch recognition unit **11** as indicative of the playback position of playing multimedia data. That is, the controller **180** may recognize the point (first point) p2 as indicative of the beginning part of the multimedia data. In this case, the second point p3, spaced apart in a straight line from the first point p2 by a predetermined distance, may be recognized as indicative of the ending part of the multimedia data.

(b) of FIG. **16** illustrates an example where an indicator bar i2 indicating the playback position of multimedia data is displayed on the display **12**.

With the display **12** attached to the frame **10**, the controller **180** may display on the display **12** the playback position of multimedia data, which changes based on a scroll input on the touch recognition unit **11**.

That is, with the frame **10** worn on the head, the user can check feedback to the scroll input on the touch recognition unit **11** through the display **12**.

The length of the indicator bar i2 displayed on the display **12** may change based on the scroll input. The controller **180** may play multimedia data while changing the playback position of the multimedia data based on the scroll input.

FIGS. **17** and **18** illustrate an example where operations related to the playback of multimedia data are controlled based on a touch input on the touch recognition unit **11**.

(a) of FIG. **17** is an enlarged view illustrating the touch recognition unit **11**. It is assumed that second and third points p5 and p6 are spaced apart in a straight line with respect to any one point (first point) p4 of the touch recognition unit **11** by predetermined distances, respectively.

The first point p4 is a point at which a signal for playing the data preceding the currently playing multimedia data is generated.

The second point p5 is a point at which a signal for pausing or stopping data playback or playing data is generated.

The third point p6 is a point at which a signal for playing the following data to the currently playing data.

The preceding or following data may denote a position in the memory **160** where the multimedia data is stored. For example, the preceding or following data may denote the data that precedes or follows the currently playing data in a playlist stored or temporarily stored in the memory **160**.

First, second, and third icons **55** (i3, i4, and i5) shown in (b) of FIG. **17** may correspond to the points p4, p5, and p6 at which the touch input of (a) of FIG. **17** is received.

For example, upon receiving an input for touching the third point p6 with a finger F7 from the user, the controller **180** may display feedback (e.g., highlighting) indicating that the third icon i5 is chosen. Based on the touch input on the third point p6, the controller **180** may generate a signal for playing the data following the currently playing data.

That is, the user can check feedback to the touch input on the touch recognition unit **11** through the display **12**. This means that, by touching a certain point on the touch recognition unit **11**, the user can find out which icon for a particular function corresponds to the detected point.

(a) of FIG. **18** is an enlarged view illustrating the touch recognition unit **11**.

It is assumed that second and third points p5 and p6 are spaced apart in a straight line with respect to any one point (fourth point) p7 of the touch recognition unit **11** and another point (fifth point) p8 are vertically spaced apart from each other by a predetermined distance.

The controller **180** may receive an input for scrolling between the fourth and fifth points p7 and p8 with a finger F8. The controller **180** may adjust the speaker volume based on the scroll input.

(b) of FIG. **18** illustrates an example **56** where an icon i6 representing the speaker volume is displayed on the display **12**. That is, the controller **180** may display the volume, which changes based on the scroll input of (a) of FIG. **18**, as the icon i6 on the display **12**.

This means that, by doing a scroll input on the touch recognition unit **11** in a vertical direction, the user can check feedback to the scroll input through the display **12**.

FIG. **19** illustrates an example where multimedia data includes image data.

As shown in (a) of FIG. **19**, the controller **180** may display the currently playing image data on the display **12**.

(b) of FIG. **19** illustrates an example of the occurrence of an event during the playback of image data. For example, upon an incoming call, the controller **180** may display information (e.g., phone number and name) e1 about the caller on the display **12**.

Upon an incoming call during the playback of multimedia data, the controller may reject or connect to the incoming call or send a response message as it receives a preset touch input on the touch recognition unit **10**.

The preset touch input may have different patterns to perform different functions. The touch input may be preset on the electronic device, or set or changed by the user.

FIG. **20** is a flowchart for explaining another example of the control of multimedia data-related operations according to the second embodiment of the present invention.

FIG. **20** is a flowchart illustrating in detail an example regarding the step S**404** of FIG. **14**.

Referring to FIG. **14**, the controller **180** may detect the frame **10**, which has been worn on the head, worn around the neck (S**404** of FIG. **14**) during the playback of multimedia data. Upon detecting the frame **10** worn around the neck **10**, the controller **180** may pause the playback of the multimedia data (S**501** of FIG. **20**).

The controller **180** may detect the frame **10** worn on the head during the pause of the multimedia data (S**502**). Upon detecting the frame **10** worn on the head, the controller **180** may replay the multimedia data from the paused position (S**503**). This means that, if the frame **10** is pulled up from the neck to the head, the controller **180** may replay the paused multimedia data.

FIGS. **21** and **22** are flowcharts for explaining another example of the control of multimedia data-related operations according to the second embodiment of the present invention.

FIG. **21** illustrates an example of operation control depending on where the frame **10** is worn during the playback of multimedia data.

As shown in (a) and (b) of FIG. **21**, the user **2** may pull the frame **10** down from the head to the neck during the playback of multimedia data. Upon detecting the frame **10** pulled down to the neck, the controller **180** may pause the playing multimedia data.

As shown in (b) and (c) of FIG. **21**, upon detecting the frame **10** pulled down from the neck to the head, the controller **180** may replay the paused multimedia data from the paused position.

(a) of FIG. **22** illustrates an example where the user **2** wearing the electronic device **100** on the head during the pause of multimedia data.

(b) of FIG. **22** illustrates an example where the paused multimedia data includes image data. As shown in (b) of FIG. **22**, upon detecting the frame **10** worn on the user's head, the

controller **180** may display a thumbnail image i7 of the image data for the paused point in time.

In another embodiment, when the detachable display **12** is detached from the frame **10** during the playback of image data, the controller **180** may pause the currently playing image data. Also, when the display **12** is attached to the frame **10**, the controller **180** may display a thumbnail image of the image data for the paused point in time on the display **12**.

Moreover, when the display **12** is attached to the frame **10**, the controller **180** may replay the image data from the paused point in time.

The above-described method of controlling the electronic device may be written as computer programs and may be implemented in digital microprocessors that execute the programs using a computer readable recording medium. The method of controlling the electronic device may be executed through software. The software may include code segments that perform required tasks. Programs or code segments may also be stored in a processor readable medium or may be transmitted according to a computer data signal combined with a carrier through a transmission medium or communication network.

The computer readable recording medium may be any data storage device that can store data that can be thereafter read by a computer system. Examples of the computer readable recording medium may include read-only memory (ROM), random-access memory (RAM), CD-ROMs, DVD±ROM, DVD-RAM, magnetic tapes, floppy disks, optical data storage devices. The computer readable recording medium may also be distributed over network coupled computer systems so that the computer readable code is stored and executed in a distribution fashion.

An electronic device may include a first touch screen configured to display a first object, a second touch screen configured to display a second object, and a controller configured to receive a first touch input applied to the first object and to link the first object to a function corresponding to the second object when receiving a second touch input applied to the second object while the first touch input is maintained.

A method may be provided of controlling a electronic device that includes displaying a first object on the first touch screen, displaying a second object on the second touch screen, receiving a first touch input applied to the first object, and linking the first object to a function corresponding to the second object when a second touch input applied to the second object is received while the first touch input is maintained.

Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

1. An electronic device comprising:

a frame shaped to be worn by a user;

a touch recognition unit provided on at least one side of the frame;

a sensing unit configured to sense whether the frame is worn over the user's ears, around the user's neck, or not worn over the user's ears or around the user's neck;

a display that is attachable to and detachable from one end of the frame; and

a controller configured to:

recognize a position of the frame based on sensing by the sensing unit, the position being a first position when the frame is worn over the user's ears, a second position when the frame is worn around the user's neck, and a third position when the frame is not worn over the user's ears and is not worn around the user's neck;

cause connection to an incoming call in response to recognition of the first position when the call is received;

cause the display to display a volume adjusting bar and an indicator for adjusting a volume level, wherein the indicator is displayed at a first position of the display in response to a first touch input received at a specific point on the touch recognition unit, and wherein a length of the volume adjusting bar corresponds to a vertical length of the touch recognition unit; and

cause the display to display the indicator at a second position of the display in response to a scrolling input received via the touch recognition unit, the scrolling input starting from the specific point and moving in a vertical direction,

wherein both the frame and the attached display are worn on a head of the user when the frame is worn over the user's ears.

2. The electronic device of claim **1**, wherein the controller is further configured to cause the connection to the incoming call in response to a second touch input received via the touch recognition unit in a pattern preset for connecting to the incoming call.

3. The electronic device of claim **1**, wherein the controller is further configured to end the connection when a change of the position from the first position to the third position is recognized during the connected incoming call.

4. The electronic device of claim **3**, wherein the controller is further configured to set a call mode to a speaker mode when the recognized position is changed from the first position to the second position during the connected incoming call.

5. The electronic device of claim **1**, wherein the controller is further configured to ignore the incoming call, such that the incoming call is not connected, in response to a second touch input received via the touch recognition unit in a pattern preset for ignoring the incoming call.

6. The electronic device of claim **1**, wherein the controller is further configured to cause transmission of a call connection request to a device corresponding to a most recent incoming call in response to a second touch input received via the touch recognition unit in a pattern preset for the transmission of the call connection request, the second touch input received while the first position is recognized by the controller.

7. The electronic device of claim **1**, further comprising a sound output unit including a bone conduction speaker,

wherein the controller is further configured to adjust the volume level of the sound output unit in response to the scrolling input.

8. An electronic device comprising:

a frame shaped to be worn by a user;

a touch recognition unit provided on at least one side of the frame;

a sensing unit configured to sense whether the frame is worn over the user's ears, around the user's neck, or not worn over the user's ears or around the user's neck;

a display that is attachable to and detachable from one end of the frame; and

a controller configured to:

recognize a position of the frame based on sensing by the sensing unit, the position being a first position when the frame is worn over the user's ears, a second position when the frame is worn around the user's neck, and a third position when the frame is not worn over the user's ears and is not worn around the user's neck;

play the stored multimedia data when the first position is recognized;

cause the display to display icons for controlling playback of the multimedia data, wherein the displayed icons are arranged in a horizontal line with respect to a first touch input received at a first specific point on the touch recognition unit; and

cause the display to display a feedback in response to a second touch input received via a second specific point on the touch recognition unit, the second specific point corresponding to one of the displayed icons that is selected by the second touch input,

wherein both the frame and the attached display are worn on a head of the user when the frame is worn over the user's ears.

9. The electronic device of claim **8**, further comprising a sound output unit including a bone conduction speaker, wherein the controller is further configured to cause the sound output unit to output sound of the played multimedia data in response to a third touch input received via the touch recognition unit in a pattern preset for playing the multimedia data.

10. The electronic device of claim **9**, wherein the controller is further configured to change a playback position of the multimedia data in response to a scrolling input received via the touch recognition unit.

11. The electronic device of claim **9**, wherein the controller is further configured to cause the display to display at least one of a title, a playback position, or a volume level of the multimedia data being played.

12. The electronic device of claim **9**, wherein the controller is further configured to pause the playing of the multimedia data when the recognized position is changed from the first position to the second position during the playing of the multimedia data.

13. The electronic device of claim **12**, wherein the controller is further configured to resume the playing of the multimedia data from a paused position of the multimedia data in response to the first position recognized by the controller while the playing of the multimedia data is paused.

14. A control method of an electronic device, comprising:

recognizing a position of a frame of the electronic device with respect to a user, the position being a first position when the frame is worn over ears of the user, a second position when the frame is worn around a neck of the user, and a third position when the frame is not worn over the user's ears and is not worn around the user's neck;

connecting to an incoming call in response to recognition of the first position when the incoming call is received;

displaying a volume adjusting bar and an indicator for adjusting a volume level, wherein the indicator is displayed at a first position of a display in response to a touch input received at a specific point on the touch recognition unit, and wherein a length of the volume adjusting bar corresponds to a vertical length of the touch recognition unit; and

displaying the indicator at a second position of the display in response to a scrolling input received via the touch recognition unit, the scrolling input starting from the specific point and moving in a vertical direction,

wherein the display is attachable to and detachable from one end of the frame, and

wherein both the frame and the attached display are worn on a head of the user when the frame is worn over the user's ears.

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